



The demands of theatre are constantly changing. What was considered adequate for productions thirty years ago is now understated. Careful planning at the beginning can increase the usefulness of the space during its lifetime. A high school multi-use auditorium today may also serve a second function as a community theatre or town hall tomorrow.

A theatre is a complicated structure. In addition to the normal building systems, it

must also integrate many specialized equipment systems specific to the theatre. These specialized systems include stage rigging, draperies, stage lighting, audio, and communication. Care must be taken to carefully coordinate all of these systems in order to avoid conflicts. The proper selection and installation of counterweight rigging equipment will result in a system that is both functional and meets current safety requirements.

Counterweight Rigging Systems:

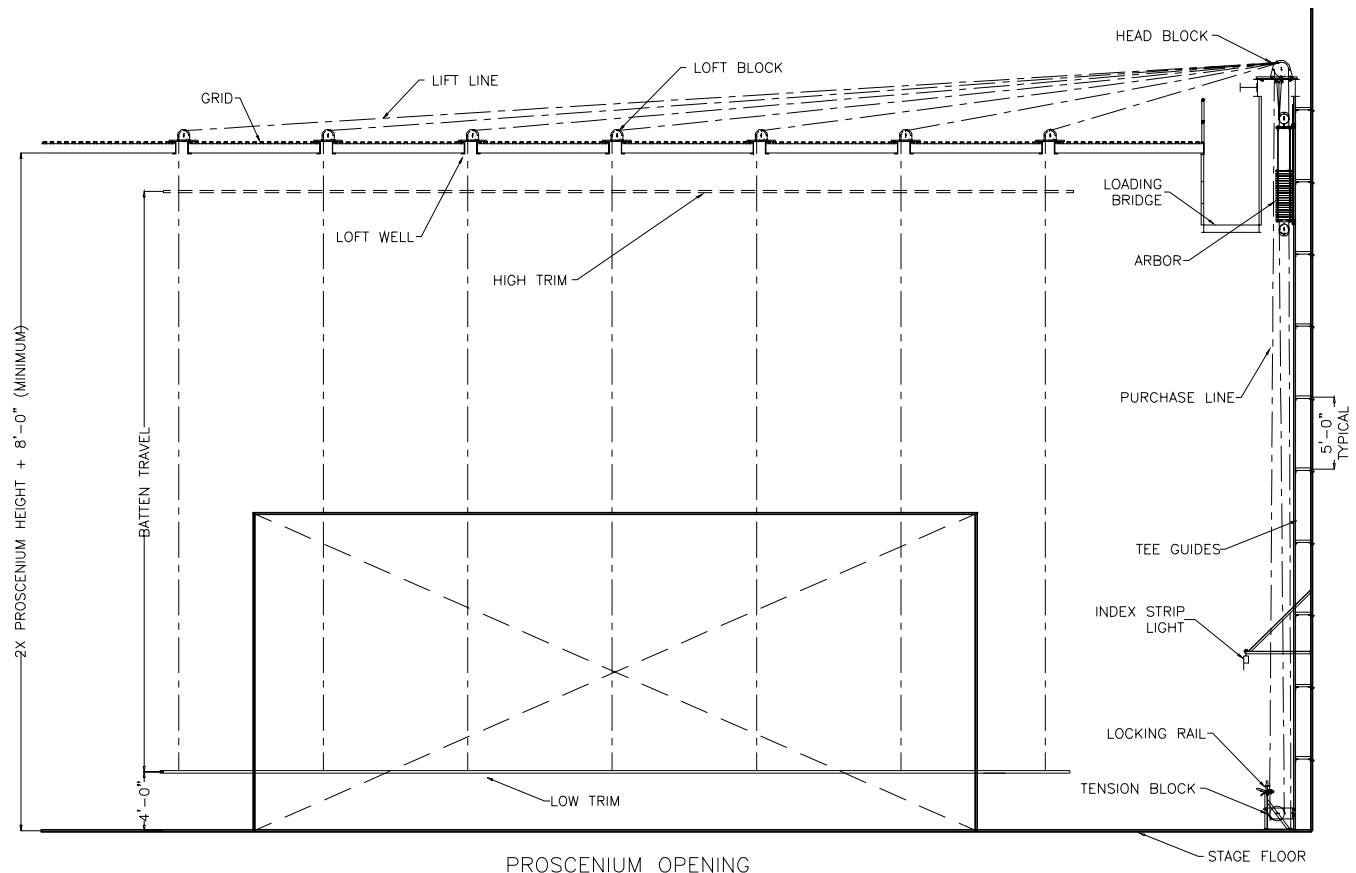
A theatrical counterweight system provides a simple method of raising and lowering various balanced loads by a system of pulleys and weight carriages. As the scenery and equipment loads are varied, the amount of counterbalance is adjusted on the weight carriage so that the system can be raised and lowered with a minimum amount of effort. A counterweight system is meant to be operated in a near balanced condition.

Rigging systems are composed of basic components. The major components include the following:

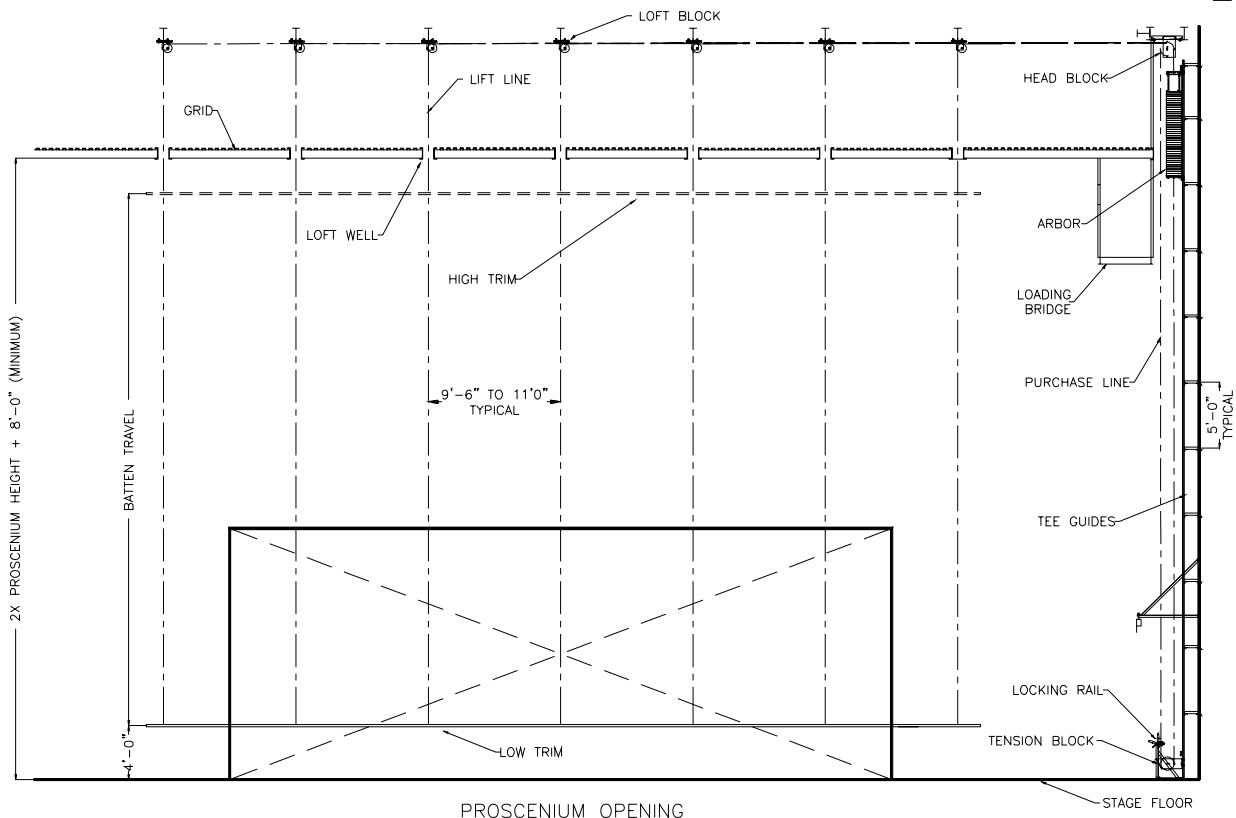
Pipe Batten: Typically a 1-1/2" standard pipe used for the attachment of draperies, scenery, lighting, and other items.

Lift Lines: 3/16" or 1/4", 7x19 galvanized aircraft cable used to support the batten at intervals approximately ten feet on center.

Loft Block: A single groove sheave assembly used in groups for the support of the pipe batten.



Typical Upright Counterweight System



Typical Underhung Counterweight System

Head Block: A multi-groove sheave assembly whose purpose is to gather all the lift lines from the loft blocks and reeve them toward the arbor.

Counterweight Arbor: A weight carriage designed so that the amount of counterbalance can be varied proportional to the load imposed on the pipe batten.

Floor Block: A single groove assembly mounted under the counterweight arbor used to reeve the purchase line from the arbor bottom toward the head block.

Rope Lock: A device used to position a balanced counterweight set at the required location in the fly loft.

Purchase Line: A 3/4" diameter manila or synthetic rope that is reeved in an endless loop and tied off at the counterweight arbor.

Upright vs. Underhung:

The type of counterweight rigging system installed is dependent on the structural support system provided by the architect and engineer. Existing facilities will dictate specific equipment and in some cases, accommodations may be needed to adjust to field conditions. When a new facility is planned, the most useful style of counterweight rigging system is an underhung system with a grid. This style

allows the majority of the counterweight rigging system to be mounted to the same structural members that support the roof while also providing a walking grid. A grid is an open framework of steel located under the roof for the support of stage rigging equipment. The grid provides a position to access the underhung rigging for inspection and maintenance. It is also an uncluttered area for the placement of specialty rigging sets or spotline rigging required for specific theatrical productions.

Upright counterweight rigging systems have a steel grid for the attachment of loft blocks and a separate raised head block beam. From the position of the head block, the cables array downward toward the loft blocks. On a fully rigged stage, accessibility across the grid becomes limited. It becomes more difficult to perform periodic inspection and maintenance of the system after installation. Also, placement of specialty rigging sets and spotline rigging required for specific theatrical productions becomes hindered.

Theatre spaces must be adaptable. In most cases, the stage is multi-use and must accommodate many functions from speech, music, dance, and drama. In addition, each theatrical production is unique and requires equipment to fly a different complement of masking draperies, scenery, and effects.



Wire Guide vs. Rigid Guide Systems:

Two styles of arbor guide systems are currently in use, wire guide and rigid guide. Wire guide systems are more economical and can be used when there is adequate clearance around arbors, and the length of the guide wires does not exceed 30 feet. Rigid guide systems can be used in applications of any length.

Single Purchase vs. Double Purchase

Counterweight arbors may either be reeved on a 1:1 (single purchase) or 2:1 (double purchase) basis. A single purchase arbor is the most efficient. In this system, for each foot of arbor travel, the batten also travels one foot. To accomplish this, one pound of counterweight is added to the arbor for each pound of load weight added to the pipe batten.

When the required travel of the pipe batten cannot be accomplished with a single purchase arbor due to an obstruction or other limitation, a double purchase arbor is used. In this system, for each foot of arbor travel, the batten travels two feet. To accomplish this, two pounds of counterweight are added to the arbor for each pound of load weight added to the pipe batten. For a given batten load, the arbor must be much longer and the efficiency of the counterweight set is diminished, resulting in more effort required to raise or lower a balanced set. The structure must be designed to accommodate the increased loads.

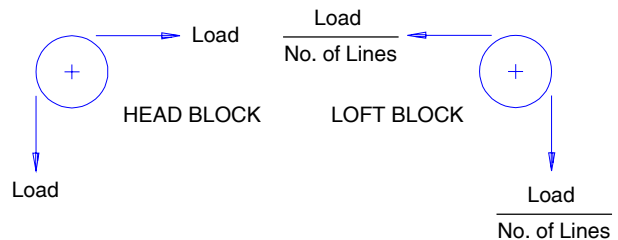
Working Load Limits:

The working load limits listed in this catalog have been arrived at through a combination of empirical data, technical analysis and standardized service factors. In general, assemblies are manufactured for a minimum 5:1 design factor, and bearings sized for two times the design load at a cable speed of 300 feet/minute for 2000 hours. Groove pressure is limited to 480 psi for cast iron, 800 psi for Nylatron GS and 1000 psi for Nylatron GSM. All working load limits are expressed in pounds of cable tension, assuming a 90 degree cable wrap. In no case does the working load

limit of a block assembly exceed 1/8 the breaking strength of the cable for which it is designed (7x19 galvanized aircraft cable).

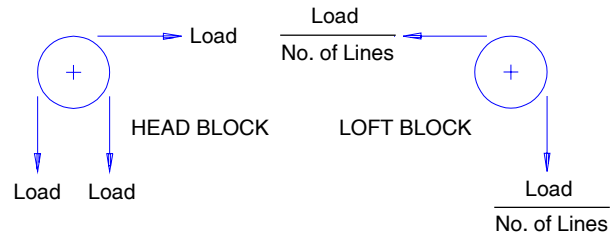
The resultant load imposed onto the building structure can be calculated as follows:

Single Purchase System



Stage rigging equipment imparts both vertical and lateral loads on head and loft block support beams. The head block beams must support the entire batten load + the dead load of the head block. Loft block loads will vary dependant upon distribution of weight on pipe batten.

Double Purchase System



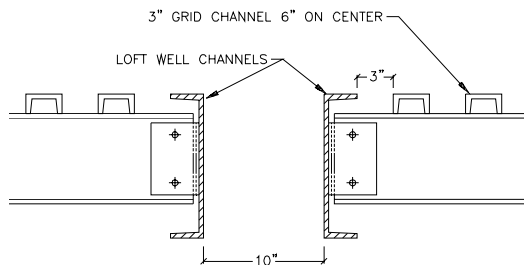
The head block beams must support the batten load laterally and twice the batten load vertically + the dead load of the head block. Loft block loads will vary dependant upon distribution of weight on pipe batten.

Modifications:

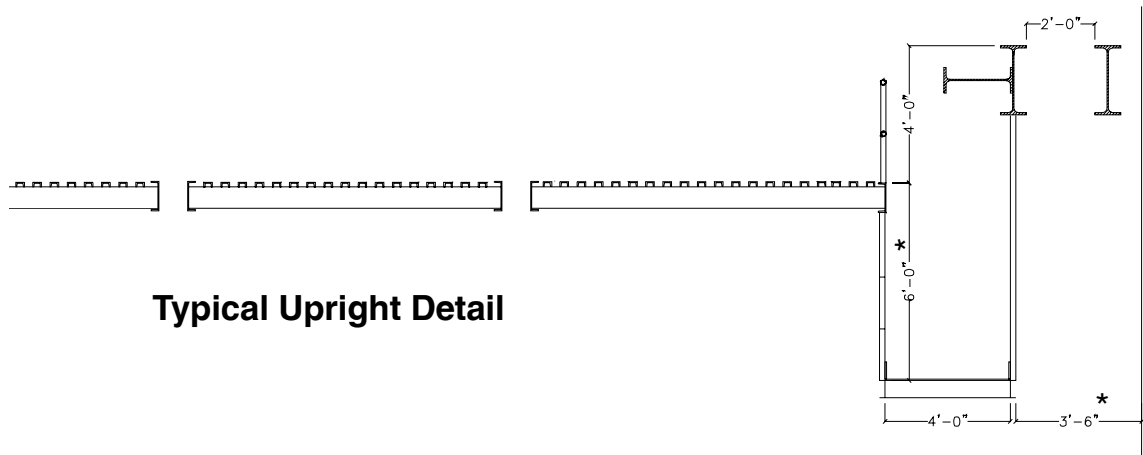
Illustrated in this catalog are the most common types of counterweight rigging equipment used in the theatre. Whenever possible, care has been taken to design equipment that will suit a variety of field conditions. When conditions exist where more specialized equipment is required, it can be manufactured to suit the unique requirements of a particular project. Consult the factory with your particular requirements.

Head and Loft Beam Details

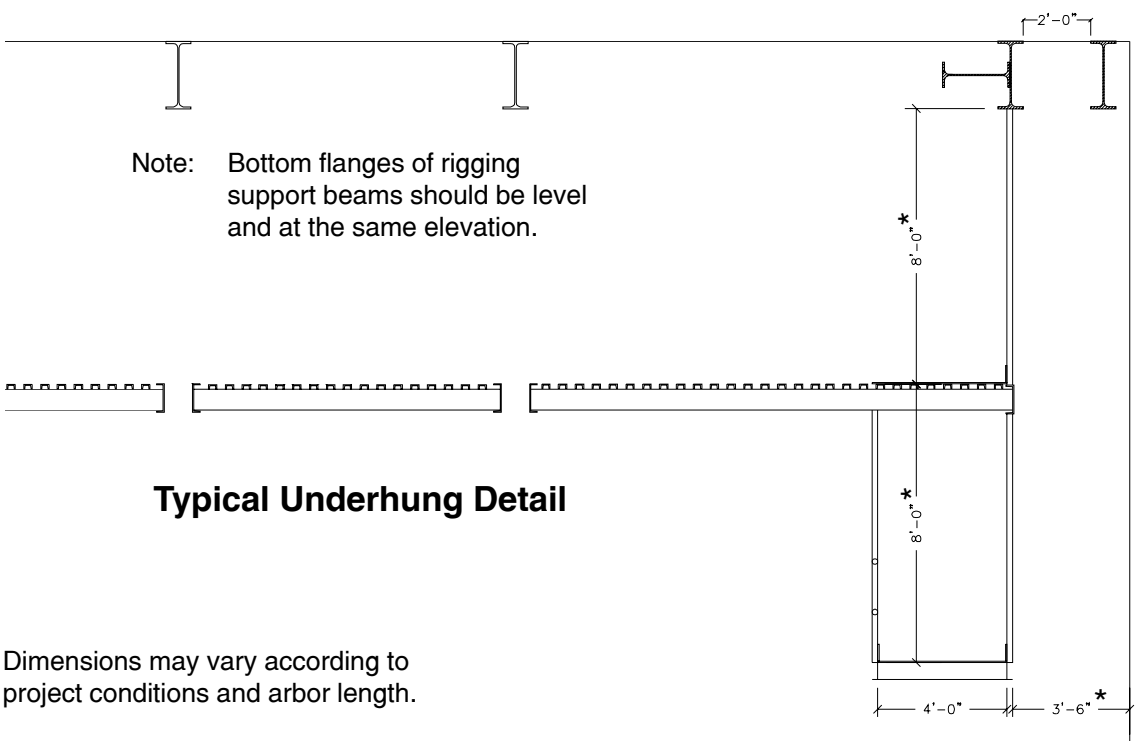
Stage rigging equipment imparts both vertical and lateral loads on head and loft block support beams. The use of the theatre space will dictate the required loads to be accommodated.



Typical Loft Well Detail



Typical Upright Detail



Note: Bottom flanges of rigging support beams should be level and at the same elevation.

Typical Underhung Detail

* Dimensions may vary according to project conditions and arbor length.